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The following communications were read:—

I. Second Series of Micrometrical Measures of Double Stars, chiefly performed with the 7-feet equatorial. By Sir J. Herschel.

This second series is a continuation from vol. v. p. 90 of the *Memoirs*, and begins with No. 736, the last in the above-mentioned page being 735. The observations have been almost entirely made with the same achromatic of five inches aperture, except in the case of a few difficult objects, for which the 20-feet reflector was used. Many of them, and in particular all those of 1833, were made with an increased magnifying power, which Sir J. Herschel calls 500, but thinks may be something less. The action of the instrument under this power is perfectly good; and, having provided himself with still higher powers, Sir J. Herschel expects to be able in future to avail himself fully of the excellent quality of the object-glass, which has hitherto become uniformly more apparent with every increase of power which has been applied to it.

Sir John Herschel's observations end at No. 1,111, and to them are added a few made by Captain Smyth and the Rev. W. R. Dawes.

II. Micrometrical Measures of the Positions and Distances of 121 Double Stars, taken at Ormskirk, in the years 1830–33. By the Rev. W. R. Dawes.

These observations are given in the same manner as those of Sir J. Herschel, and are 406 in number. For a description of the instrument employed, see *Memoirs*, vol. v. p. 135. Mr. Dawes further states, that the mounting and entire arrangements of his 5-feet achromatic are exactly similar to those of Capt. Smyth's larger instrument, described in the *Memoirs*, vol. iv. p. 550. The spherical aberration is perfectly destroyed, and the discs of stars shewn with beautiful neatness on a dark ground.

"Since the middle of the year 1831, I have uniformly placed the stars between the parallel threads in measuring their position. This plan, suggested to me by Sir J. Herschel, I much prefer to any other. I can also speak in the highest terms of the advantage accruing from the use of a red illumination of the field; and I usually employ as deep a colour as the light afforded by the lamp will permit. But the most important improvement I have yet tried, consists in the interposition of a concave achromatic lens between the object-glass and its principal focus, by which the focal image being enlarged to above twice its original size, a very high magnifying power may be obtained, while the threads of the micrometer appear of sufficient fineness to permit the measurement in distance of very close and minute stars without distortion. Having frequently felt the inconvenience arising from the threads being mag-

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nified in proportion to the power used on the telescope, I stated the difficulty to Mr. Dollond, who speedily and most perfectly removed it by the application of the lens above mentioned. The effect is the same, in respect of the power of the telescope and the fineness of the threads, as if the focal length of the object-glass were increased to about 10 feet 2 inches.

"The magnifiers, with the micrometer, have been varied according to the object and the circumstances. At first I usually employed 226; this was subsequently exchanged for 285, which was found more generally efficient; while 55, 80, and 140, were occasionally applied for very faint objects, and 350, 480, 550, and 625, for very close or bright ones. Since the acquisition of the concave achromatic lens, a power of 295 has been most frequently employed, by using the eye-tube which without it magnifies 140 times; but in very unfavourable circumstances, or on excessively faint objects, 170 has been occasionally substituted. The highest magnifier has, however, generally been used, which the state of the atmosphere and the brightness of the object would permit; and great advantage has frequently been derived from the use of 475 or even 600.

"With the five lower eye-tubes a *diagonal prism* can be employed, the highest power to which it was originally applicable being 285; but since with the second object-lens this eye-tube magnifies 600 times, the use of the prism is proportionally extended. And it appears to me that much greater benefit may be derived from this little appendage than merely the increased comfort to the observer, in releasing him frequently from a very awkward position, and placing him in one comparatively luxurious, though this alone exerts no small influence on the correctness of these extremely delicate observations. But I should chiefly recommend the prism to those who are seriously engaged in these researches, as enabling the observer to place the *stars* in any positions he may please with relation to a vertical circle. Thus he may get rid of one of the principal difficulties in measuring objects correctly, whose position is between 30° and 60° from the parallel, and which, I am persuaded, has had a large share in producing the discordant results in the angles of ε *Boötis*, 70 *Ophiuchi*, ζ *Boötis*, *Canis Minoris* 31, and others. By simply turning round the eye-tube and its annexed prism, we may place such oblique stars either *vertically* or *horizontally*, or we may *invert* their relative situation; and thus, by taking a few observations in each apparent position, much may, I feel convinced, be done towards destroying any bias of judgment which might arise from the oblique position of the stars, or from an unconscious disposition to place the threads of the micrometer in the direction of a *tangent to the discs of moderately unequal stars*, and that principally on *one side* of them."

Measures of distance were usually taken alternately on each side of the zero, instead of employing an index correction. They are in most instances decidedly smaller than those of MM. Herschel and South, *Phil. Trans.* 1824, and somewhat larger than those of Professor Struve. Distances often vary to an astonishing extent

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when the stars are well defined: at other times the converse takes place.

A central disc on the object-glass was found to increase the *separating* power of the telescope; but the concentric rings round bright stars were thereby multiplied, made more luminous, and thrown further from the disc.

The estimated weight of each observation was fixed upon before the index was read off; and every suspected observation was re-made. If the second observation decidedly agreed with other measures, the suspected one was rejected; but if not, both were made to form part of the set. All the original observations of the series, 4400 in number, have been preserved.

Mr. Dawes makes several comparisons of his own observations with those of others. With regard to some stars, he has found reason to suspect some alteration; with regard to others, he can give no support to surmises respecting their binary character. Among the stars which furnished the former result, Mr. Dawes mentions *Ceti* 292, γ *Ceti*, Σ 389, *Tauri* 34, 2 *Camelopardalis*, 38 *Geminorum*, H. I. 69, ε *Hydræ*, 35 *Sextantis*, 44 *Boötis*, ξ *Libræ*, S. 757, H. 87, *Pegasi* 29, ζ *Aquarii*, Σ 3061; among the latter, 32 *Eridani*, H. I. 70, H. I. 84, H. III. 48, *Canis Minoris* 31, ζ *Boötis*, δ *Serpentis*, Σ 2339, *Tauri Poniat.* 75, *Cygni* 280.

III. List of Observations made with the Transit Instrument, from April 10 to May 24, 1833, and with the Mural Circle, from May 16, 1832, to May 24, 1833, at the Cape of Good Hope. From Mr. Henderson.

The transit observations were made (with a few exceptions) by Lieut. Meadows, and the circle observations by Mr. Henderson.

IV. Apparent Geocentric Positions of Encke's Comet, deduced from observations made by Mr. Henderson and Lieutenant Meadows, at the Observatory, Cape of Good Hope, and by M. Mossotti, at Buenos Ayres, in June 1832. In a letter from Mr. Henderson to Professor Airy.

These positions have been computed by Mr. Henderson from the observations, and he has compared them with those interpolated from Mr. Encke's accurate Ephemeris, communicated to the Society in May 1832. Mr. Henderson considers, as a definitive result obtained from the Cape observations, that the mean correction of the ephemeris in right ascension is $+2' 25''$ reduced to a great circle, and in declination $+ 1' 30''$, the mean corresponding date being June 5, 1832.

V. Catalogue of the North Polar Distances of 60 Stars, reduced to January 1, 1830, derived from Observations made at Greenwich by the two circles and six microscopes, 1825–1833. From the Astronomer Royal. J. Pond.

The results are here compared with those of M. Bessel, the observations having been previously reduced by his refractions. The catalogue is deduced from 30,000 observations, for the most part by reflexion with both circles. Mr. Pond considers that the